WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: LA2541

Title: Determining Uncertainty in Capture Zones and Interference from High Volume Wells

Focus Categories: Groundwater, Management and Planning

Keywords: Groundwater Management, Statistical Analysis, Groundwater Modeling

Start Date: 04/01/2001

End Date: 03/31/2002

Federal Funds: $16,000

Non-Federal Matching Funds: $41,598

Congressional District: 06

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Abstract

While the amount of freshwater in Louisiana aquifers is enormous, the supply is not infinite, particularly in a local sense. Water levels have been dropping in many aquifers and some regions have experienced an increase in salinity levels. Recent developments have raised the question as to whether groundwater withdrawals should be regulated at the state or local level---as of now, there is no policy or regulation concerning the use of our groundwater resources. In the past year, several issues have prompted the state to investigate the development of a state water policy and possibly a regulatory framework. The purpose of this project is to provide a scientifically-based framework with which to guide groundwater policy and management decisions related to the capture zones and interference associated with high volume wells.

The hypothesis of this proposal is that the management decision-making process will be improved by the development and application of an efficient water resources modeling framework that accounts for data uncertainty. Acknowledging the significance of parameter uncertainty in groundwater modeling, the objective of this research project is to develop a methodology for quantitatively including the effect of parameter uncertainty when modeling the groundwater hydraulics of high-volume point source production wells. Specifically, the following specific objectives are defined:

1. Determine the significant parameters affecting the hydraulics of production wells.
2. Determine a methodology for estimating the uncertainty in these significant parameters.
3. To develop a framework for incorporating the uncertainties into standard groundwater flow and transport packages.
4. Utilize the results of objectives 1 through 3 above through simulations of a LA groundwater aquifer.

The methodology employed in this project will be to use geostatistical simulation as input to a deterministic groundwater flow model. The uncertainty in model predictions is quantitatively evaluated by constructing cumulative probability distribution functions of the model results, or estimating the probability that a particle will be captured. By utilizing a common set of groundwater flow and transport packages, this project will provide a basis for modeling these systems and assessing the impact on a "local" scale in

Louisiana aquifers. This project will complement an existing project evaluating the ability of an aquifer to sustain long-term, high-volume 1ground water withdrawal from point sources. The information so gained will be of significance in planning, designing, evaluating and managing groundwater well systems. The methodology will also be useful for scientists and engineers who are trying to convey to policy makers or regulators a better description of the uncertainty associated with groundwater systems.